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II

PHYSICAL ASPECTS.

THE AIR.

BY GEORGE O. SQUIER.

Everyone knows of course that if there were no atmosphere there could be no life, but probably very few fully realize its immense importance in almost every thing we do. In one condition it is invigorating and gives us a zest for hard work whether mental or physical, in another it leaves us depressed and incapacitated for efficient labor of any kind. Numerous manufacturing processes are radically affected by the amount of moisture in the air, and many others by its temperature. Power is transmitted by it; we communicate our thoughts one to another by vibrations of the air; and by its aid we have recently acquired our swiftest mode of travel. Obviously then a knowledge of the composition and physical properties of the air is of such vital importance as to justify most painstaking study and investigation.

In the past few years, for instance, several elements, helium, argon, neon, krypton, xenon, have been found in the atmosphere that previously were unknown and even unsuspected, for they were not required by the Mendeleeff table of the elements as then understood. One of these, argon, amounts to nearly one part in a hundred of the whole atmosphere, and yet through decade after decade of chemical investigations involving countless thousands of air analyses, it, and all its family of gases, remained undiscovered!

Recently, too, means have been found for drawing directly on the atmosphere for an inexhaustible supply of nitrogen compounds used in the production of powerful explosives, fertilizers and many other things of great value.

Not long ago even the most profound scientists believed that with increase of elevation the temperature of the air decreased more or less uniformly from whatever it was at the surface of the earth to absolute zero at an elevation of perhaps 30 to 40 kilometers. Now we know that this is not true, that at an elevation of only 10 to 12 kilometers at this latitude the temperature becomes substantially constant with respect to increase of altitude, and, what is of even greater intellectual interest, we can explain why it must be so. Only a little while ago no one could say why the clouds never rose higher than certain levels that were far below the known heights of the atmosphere. Now we do know why this is true, as we also know why clouds are more abundant at certain levels and less abundant at others.

We recently have learned how the velocity of the wind generally increases with altitude, and why it so increases. At last, and that quite recently, we have found a logical and experimentally supported theory of the electrification that gives the lightning flash, and with it we have acquired a clearer understanding of the mechanism of the thunderstorm.

These are only some of the comparatively recent discoveries in connection with the phenomena of the atmosphere, and opportunity lies near and inviting for many more.

The genesis of the ordinary cyclonic storm still needs much study and discussion. The relation of topography, nature of the surface, sunshine, etc., to air movements, both horizontal and vertical, need to be intensively studied because of their importance to the art of aviation, especially aviation as a means of commercial travel and as a sport. Through this investigation we may reasonably hope to acquire the art of soaring, and thereby realize the gentlest of all modes of travel.

The immediate problems of the atmosphere calling for solution are numerous, but I shall mention only one more. On the whole the earth is negatively charged. What then is the origin of this negative charge and how is it perpetually maintained?

War Department.
Office of the Chief Signal Officer,
Washington, April, 1917.